

Technical Notes ON BRICK & TILE CONSTRUCTION

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STRUCTURAL CLAY PRODUCTS INSTITUTE

REINFORCED BRICK MASONRY — IV (Construction Details)

INTRODUCTION

Only a few examples of walls, connections and details of RBM are shown in this bulletin. They are not to be considered as standards to be used without question, but are merely suggested methods. The actual details to be used in any structure should depend upon the particular design conditions. The designer must use ingenuity and, above all, keep in mind the basic factor of tying the parts of the structure together for the transfer of calculated stresses and for the intangible demands of dynamic loading.

WALL TYPES

In Vol. 5 No. 1 of Technical Notes were illustrated different types of RBM walls (Figs. 2, 3, 4 and 5). Some of these were shown again in Vol. 5 No. 3.

RBM walls may be bearing walls, with or without pilasters, curtain or filler walls in skeleton frame construction, shear walls, or partition walls. Combinations often occur. An important thing in lateral force design is to consider all walls as part of the structure. Even partitions, for example, have structural action in earthquakes due to the creation of inertia forces by their mass. These forces must be transmitted to points of lateral support.

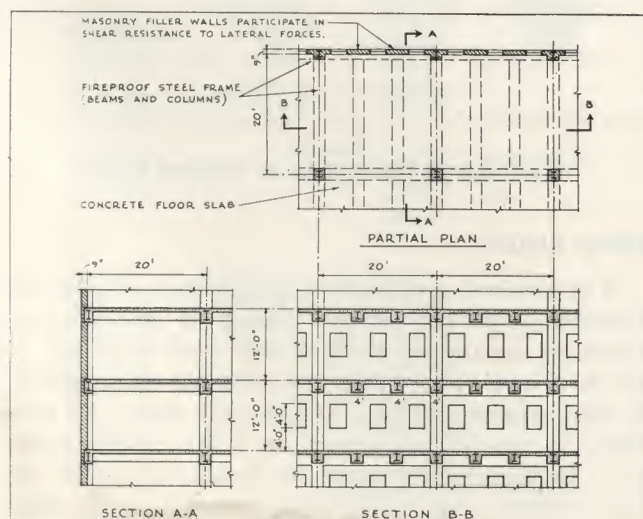


Fig. 1

One Bay of Skeleton Frame Construction

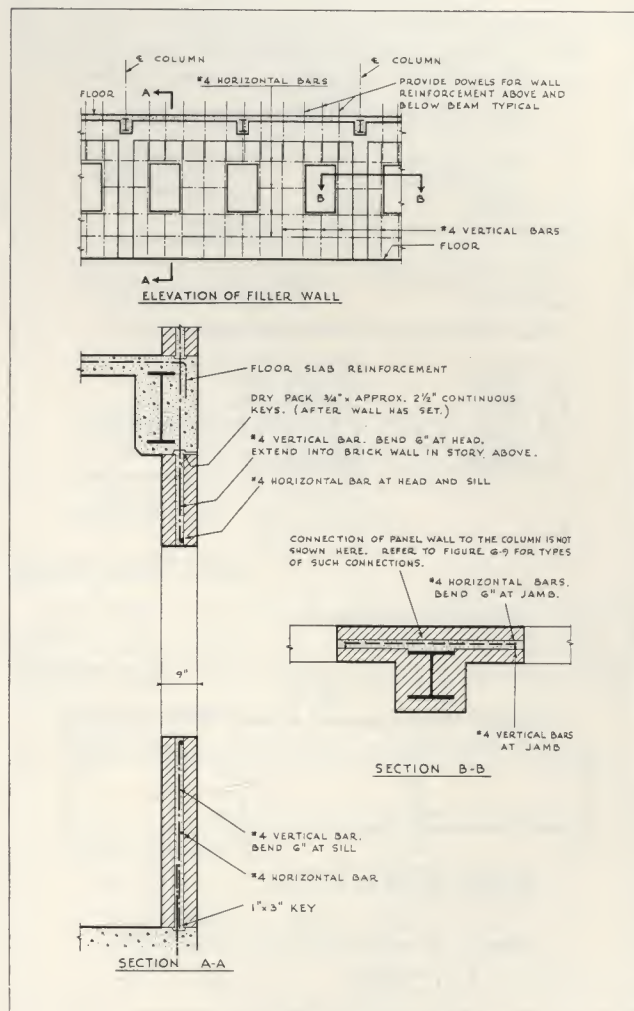


Fig. 2

Wall Construction and Placement of Bars in Skeleton Frame Construction

In bearing walls, pilasters are used where wall heights are great or where concentrated loads occur. Bond beams and, sometimes, intermediate wall beams may be used also.

Curtain walls of multi-story buildings are used in conjunction with structural steel or reinforced concrete frame. In Fig. 1 is shown one bay of a typical skeleton frame building with RBM filler walls, while Fig. 2 indicates the wall construction and the

placement of steel. Even though such walls are assumed to carry no load other than their own weight, they will tend to deflect and be stressed as the structural frame yields under lateral forces. Since their relative rigidity is usually much greater than that of the frame, they will be subjected to a large part of the lateral force. Consequently, the walls should be tied to the framework at all points of contact. In Figs. 3 and 4 are details illustrating methods of reinforcing around wall openings and lap splices and dowels.

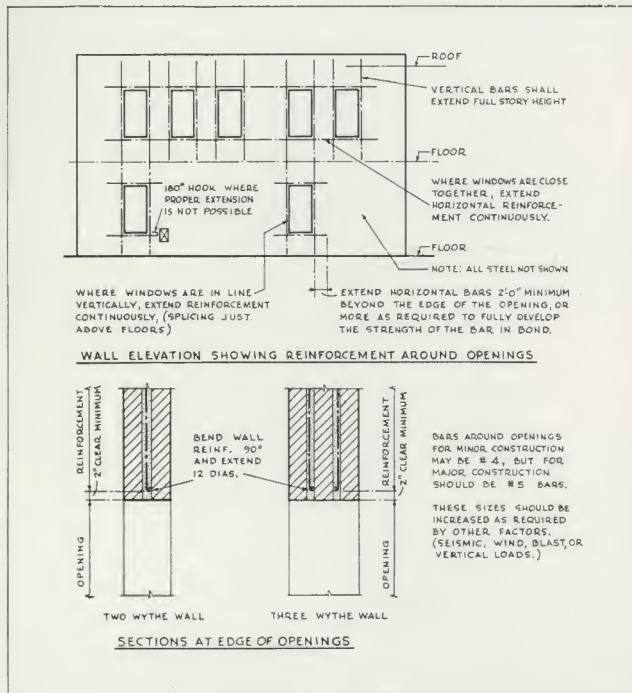


Fig. 3

Typical Reinforcement Around Wall Openings

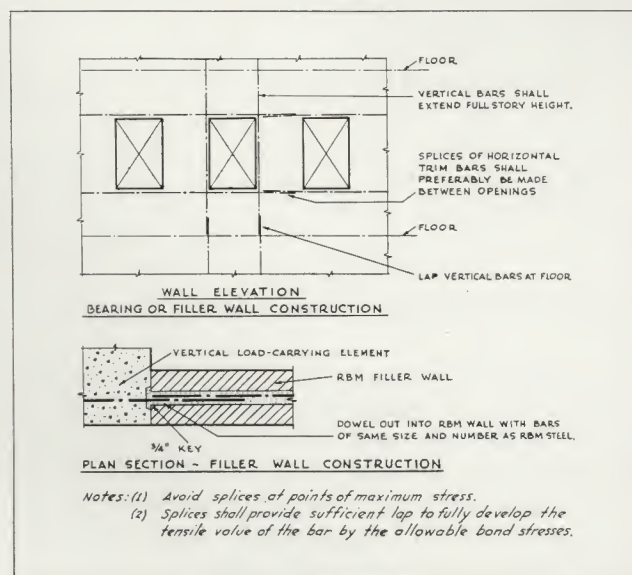


Fig. 4

Lap Splices and Dowels in RBM Construction

CONNECTIONS AND ATTACHMENTS

There are many possible ways of connecting walls to frames, floors and roofs. Several suggested methods are illustrated in Figs. 5 and 6. It is important that (1) the connections are made as often as possible to avoid large stress concentrations, (2) they are made adequate for the assumed forces, shears, etc., and (3) they are made as simple and easy to build as possible. The methods illustrated should be altered as required for any particular problem.

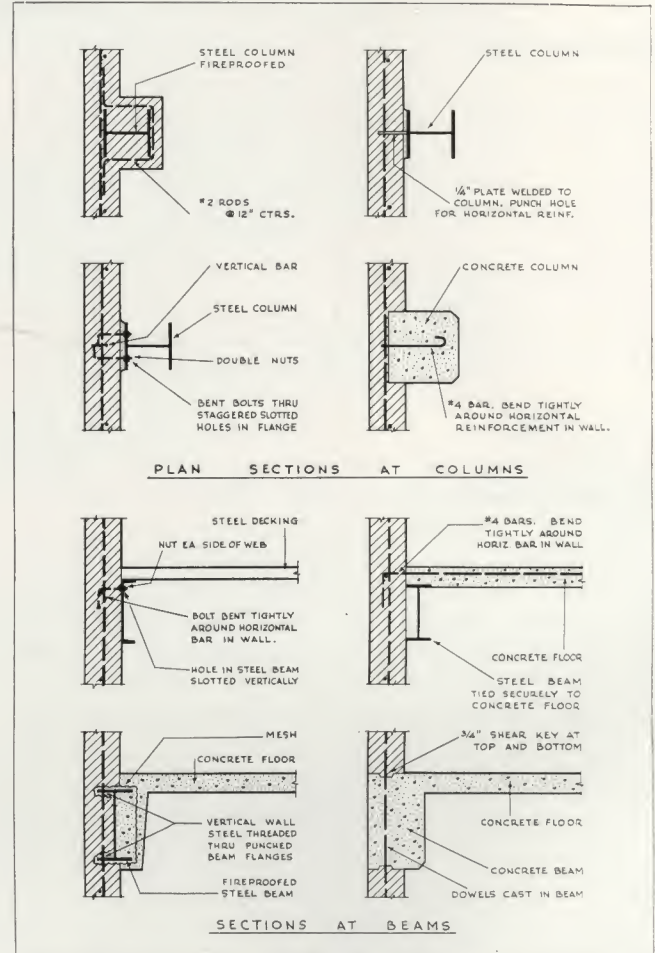


Fig. 5

Attachment of Panel Walls to Skeleton Frame

BOND BEAMS

A bond beam is a "jack of all trades." It may be considered as an element which is placed continuously around all walls at each floor level and at the roof level, and which has strength and rigidity in compression, tension, flexure and shear. It also helps to provide anchorage for bolts, straps, bars, etc. In framed structures, the frame can act as the bond beam. In wall-bearing construction, reinforcing bars can be provided as shown in Fig. 7. The bond beam may function as a member of a

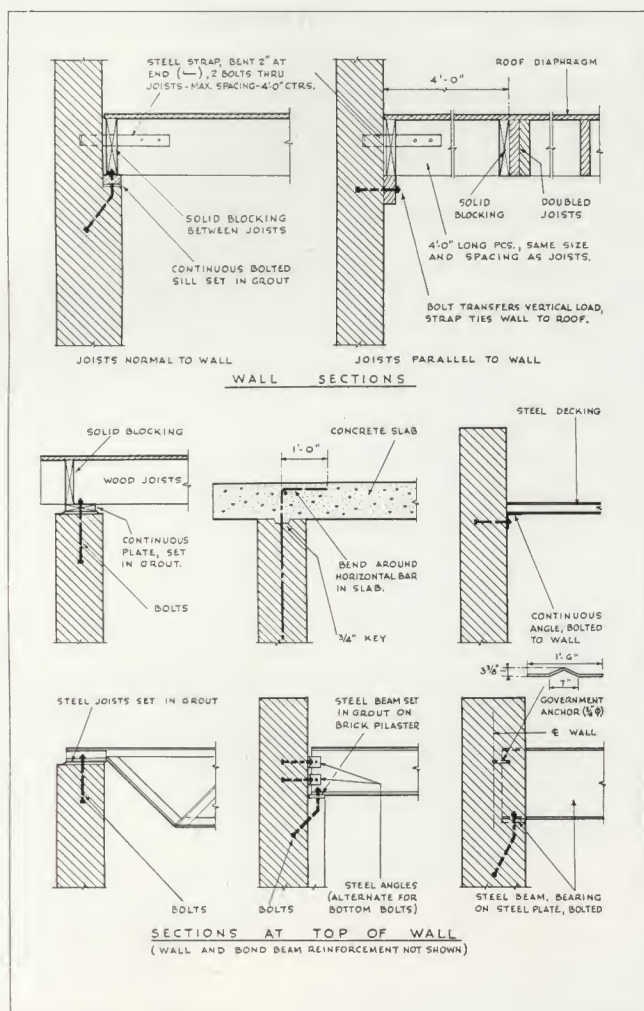


Fig. 6

Attachment of Floors and Roofs in Wall Bearing Construction

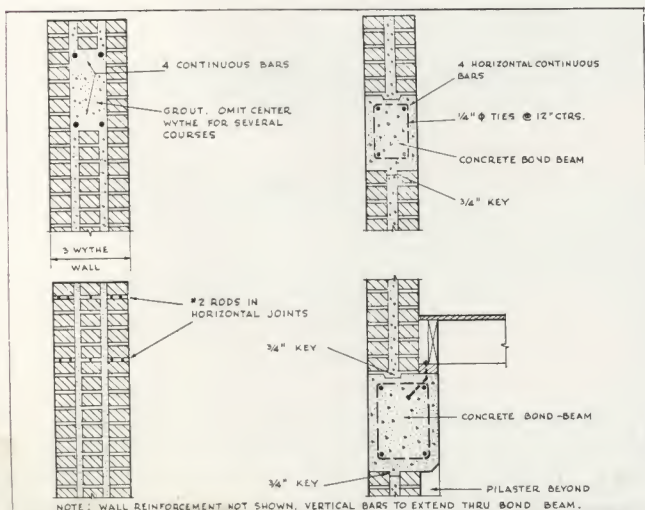


Fig. 7

Sections Through Typical Bond Beams in RBM Construction

horizontal bracing system (truss) or as the flange of a plate girder (the diaphragm). It will often be loaded horizontally and sometimes vertically and must be designed accordingly. All reinforcement must be continuous, including around all corners.

JOIST ANCHORS

All floors and roofs must be well tied and anchored into walls, even in wood construction. Wood joists should be anchored with a type of anchor shown in Fig. 8. The strap anchor, which has more positive action, is preferable to the rod anchor. Whatever the detail, anchors should be placed close enough together to avoid excessive stress concentrations.

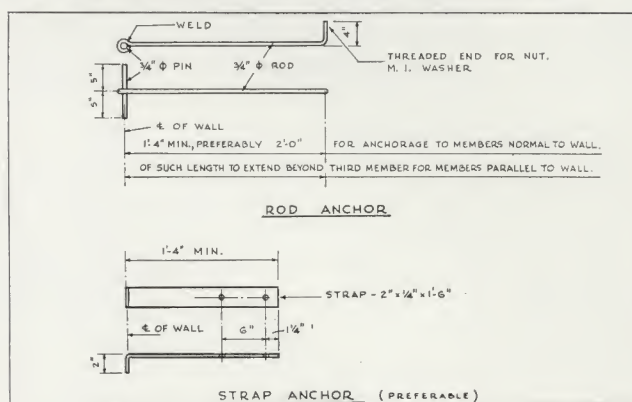


Fig. 8

Joist Anchors

SHEAR RESISTANCE

It is often necessary to place reinforced masonry walls in the interior of a structure to function in resisting shear from lateral forces, and in providing

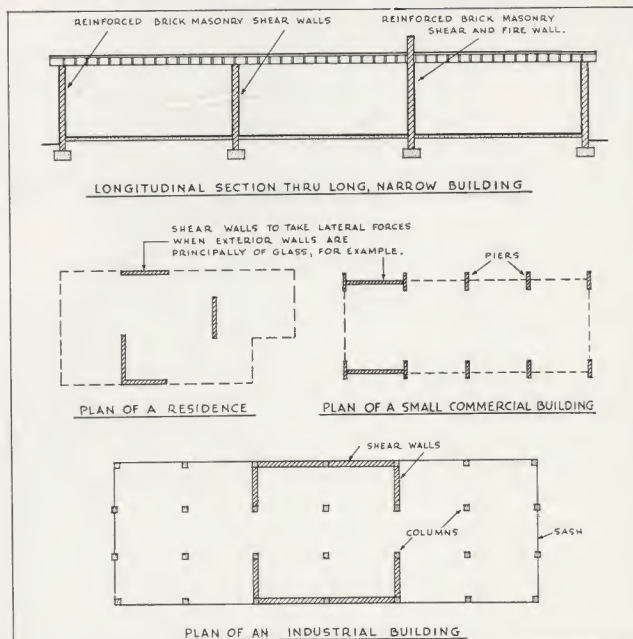


Fig. 9

Reinforced Brick Masonry Shear Walls

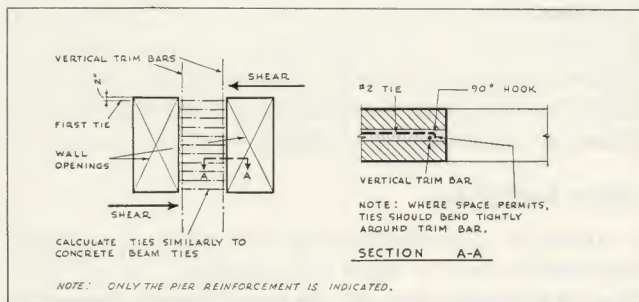


Fig. 10
Steel Ties for Shear Reinforcement

rigidity of structural walls (Fig. 9). Occasionally it also becomes necessary to add shear reinforcement to a pier as shown in Fig. 10. Ties can be used to reinforce special sections as shown. In general, how-

ever, such critical areas should be avoided by the use of thicker walls or fewer openings. Too much steel is costly and its necessity in design indicates inadequate masonry area and/or a plan layout poor in lateral force resistance.

CONCLUSION

Space does not permit including in detail many of the typical construction details for reinforced masonry construction. However, once the designer becomes familiar with the design and functions of RBM, he will be able to develop his own details based on the requirements of the particular design. Those illustrated in this bulletin may serve to give him some general idea how such construction details may be developed.

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